ROYAL ASTRONOMICAL SOCIETY.

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G. B. AIRY, Esq., President, in the Chair.

Thomas Barneby, Esq., Worcester;
Thomas Turner Wilkinson, Esq., Burnley, Lancashire; and
Sir William Keith Murray, Bart., Stonehaven,
were balloted for and duly elected Fellows of the Society.

Signor A. de Gasparis was balloted for and duly elected an Associate of the Society.

We announce with great sorrow that our respected and venerable associate, Professor Schumacher, died at Altona on the 28th of December last. The Council would gratefully receive any particulars of his life and valuable publications for the *Annual Report*.

On a Method of regulating the Clock-work for Equatoreals.
By the President.

The President resigned the Chair to the Rev. R. Sheepshanks, and gave orally an account of a communication from himself to the Society, which he had placed in the hands of the Secretary. The subject of this paper is supplementary to that of a paper (presented to the Society several years since and printed in their *Memoirs*), "On the Regulator of the Clock-work for Equatoreals." It was shown in that paper, by mathematical investigation, that when the motion of clock-work is regulated by centrifugal balls, whether those balls be suspended to a vertical axis or to a cross-piece carried by a vertical axis, or whether the axis be or be not loaded with a fly-wheel, the balls may alternately approach to and recede from the vertical position, and the angular motion may therefore be irregular. And it was pointed out as a fact of observation that there is frequently a strong tendency to this irregularity: and this was completely explained by remarking that, if the balls once receive in the slightest degree the elliptic motion which produces these appearances, the friction-resistance by which the clock-work is regulated occurs only when each ball is at the extremity of the major axis of its ellipse, and that the effect of resistance at this place is to diminish, not the major but, the minor axis of the ellipse, and thus to render it more and more strongly elliptical. The

purpose of the present paper was to point out a practical corrective of this inequality of movement: and the following was laid down as a general theorem, of which, in any special case, it is not difficult to give mathematical proof. If a part of the machinery can be selected, so connected with the revolving parts, that when the balls revolve in a circle, that part will be at rest, and when the balls revolve in an ellipse that part will oscillate; and if the movement of that part be subject to friction; then the oscillation and the ellipticity of movement will infallibly be diminished: and if the friction follow such a law that, as the motion diminishes, the friction becomes less than any assignable quantity, then the ellipticity of movement will be diminished without influencing the rate of the clock. The only kind of friction which appears proper for this purpose is the resistance of a perfect fluid to the motion of a plate through it.

Two instances were then pointed out, in which this principle had been successfully applied, though in different ways. The first is in the clock-work of the Liverpool equatoreal; the expansion of the centrifugal balls causes a slider upon the vertical spindle to rise, and elliptic motion of the balls therefore produces oscillation of the slider; the slider is connected by a lever with a plate of metal moving in a vessel of water; and the resistance of this water to the movement of the plate quickly reduces elliptic to circular movement, and produces no effect whatever on the circular movement. The second is in clock-work now in construction for giving uniform movement to a barrel intended to receive the record of transits in the American manner: in this clock-work, which is constructed on principles explained in a former discourse to the Society, a wheel of the clock-train drives the wheel that revolves with the pendulum by the intermediation of a wheel, which is partially free: elliptic motion of the pendulum therefore produces oscillation of the frame carrying the intermediate wheel. This frame is connected with plates moving in vessels of water; and here also the resistance very rapidly reduces the elliptical to circular motion. The President concluded by saying that he considered the practical problem of producing smooth and uniform motion to be now completely solved.

Observations of the Planet Saturn, accompanied by his eight Satellites, Nov. 21, 1850, *at about* $9^m\ 20^h$ *G.M.T.**

By Mr. Lassell.

"The sky cleared at about 8 P.M., and on going into the observatory at $8\frac{1}{2}$ I found the atmosphere very fine. I scrutinised the planet for some time, with various powers, *e.g.* 219, 567, 614.

* It will be seen that the notices respecting *Saturn*, his rings and satellites, do not admit of classification, without altering the *form* of the communications. The division in the *outer* ring was seen by MM. Lassell and Dawes. Mr. Bond discovered the *inner dusky* ring, which was partially seen by Mr. Lassell just before he read Mr. Bond's discovery.

I several times suspected a second division of the outer ring at both ansæ, but could not *absolutely* verify it. The appearance I saw, or suspected, was a line one-third of the breadth of the outer ring from its outer edge.*

"*Mimas* was first detected with 614, and afterwards seen, even more pleasantly and steadily, with 219, and without any hiding of the planet. Indeed, all the satellites, but *Hyperion*, were exhibited in one view with this power. The sky was very light from the bright moon, and I could not find *Hyperion* with any lower power than 614. I had not calculated its place, nor had I the slightest idea at the moment where it was to be found. When I had detected it, I was astonished by its faintness, and am persuaded that it must vary considerably in brightness, and that when *first* discovered it must have been even at an unusual maximum. I had the greatest difficulty in measuring its position, and was obliged to take its distance from a star in the first instance, and afterwards ascertain the distance of that star from the planet. The dusky south pole and ruddy belt of *Saturn* were very remarkable. The shadow of the ring upon the ball seemed serrated, and the upper edge of the ring crossing the ball seemed a *dark line*, not so broad or strongly marked, however, as the shadow below it.

"The following are measures in position and distance, along and at right angles to a parallel of declination, which may serve, at least, as an approximate epoch of the places of the satellites. The nearest four are estimated: the others are micrometrically measured:—

	″		″		
Mimas	4	South	23	West	Estimated.
Enceladus	6	—	20	East	
Tethys	5	North	28	West	
Dione	10	South	38	West	
Rhea	2	North	80	West	Measured.
Titan	16	South	157	West	
Hyperion	32	North	119·5	East	
Japetus	76	South	201	East	

"A more accurate epoch, however, of the satellites *Titan* and *Rhea*, will be furnished by reference to some observations I made on the 13th Sept., of an inferior conjunction of both of them with the planet.

"1850, Sept. 13,

$11^h\ 55^m\ 23^s$ G.M.T., *Rhea* is optically in conjunction with *Saturn*; a mean of 3 micrometrical measures gave the satellite 18″·0 north of the planet's centre. *Titan* is approaching conjunction, but is evidently a little short.

$11^h\ 59^m\ 38^s$, *Rhea* is not sensibly past conjunction.

* Mr. Lassell sent a sketch showing the position and appearance of this division, which is seen in the woodcut at p. 24.

$12^h\ 3^m\ 40^s$, *Rhea* is now, I think, past conjunction, and *Titan* is very near it.

$12^h\ 15^m$, *Titan* is now fully up to conjunction, and *Rhea* evidently past.

$12^h\ 24^m$, *Titan* is now, I think, *rather* beyond conjunction, but the atmosphere is exceedingly unfavourable.

$12^h\ 27^m$, *Titan* is now apparently past.

A mean of 3 measures gave *Titan* 39″·4 north of *Saturn's* centre. I estimate the most probable time of conjunction of *Rhea* to be $11^h\ 58^m$, and of *Titan*, $12^h\ 15^m$ G.M.T.

Interior Ring of Saturn.

Great interest has been excited by the discovery at Cambridge, U. S. of an additional *inner* ring to *Saturn*. This was announced in the *Liverpool Albion* by the following paragraph, which was copied into *The Times* of Dec. 3d, 1850:—

"*Discovery of a Third Ring round the Planet Saturn.*—Letters received from Boston by the Africa announce the discovery, on the night of the 15th ult., of a third ring round the planet *Saturn* —a phenomenon which had been for some time suspected. It was announced that this important fact was ascertained by the astronomers at the Observatory at Cambridge. It is interior to the two others, and therefore its distance from the body of *Saturn* must be small. It was well observed through the great equatoreal, with powers varying from 150 to 900; the evening for astronomical observations being remarkably fine, perhaps the finest since the establishment of the Observatory, although, singularly enough, the sky was so hazy, that to the naked eye only the brighter stars were visible. It will be remembered, that the eighth satellite of this planet was also discovered at Cambridge, by Mr. Bond, about two years since."

We believe that no information has been received *directly* from Mr. Bond; but Capt. Smyth has had a letter from the Honourable Edward Everett (dated 26th November last), from which the following extract is taken:—

"Mr. Bond has lately announced the discovery of a third ring of *Saturn*, interior to the other rings. This is not to be confounded with Struve's supposed resolution of the other rings, which Mr. Bond's observations do not confirm. The new ring is believed by Mr. Bond to be thicker than the other rings. Before he had ascertained its existence as a separate body, and while he supposed it to be a part of the inner of the hitherto known rings, he supposed that the thickness of the latter was not uniform, but that it increased towards the planet. This appearance he now refers to the greater thickness of the edge of the newly-discovered ring. He is entirely confident of the reality of the discovery; and such are Mr. B.'s accuracy and caution, that I think it may fully be depended upon.

He will before long communicate to the American Academy a full account of it."

The Times containing the news of Mr. Bond's discovery did not reach Mr. Dawes at Wateringbury till December 4,* but on the evening of December 3 an appearance resembling that remarked by Mr. Bond had been noticed by Mr. Lassell, then on a visit to Wateringbury. Mr. Lassell's description, taken from a letter to the Astronomer Royal, is as follows :—

"1850, Dec. 3. Being on a visit of a few days at Wateringbury, the residence of my friend the Rev. W. R. Dawes, the clouds, which had covered the sky uniformly for more than 24 hours, suddenly cleared off about $9^{h}\cdot0$, when we went into the observatory, and turned the telescope, by Merz, of $6\frac{1}{3}$ ins. aperture, and $102\cdot5$ ins. focus, on the planet *Saturn*. The eyepiece principally applied was an excellent single lens, magnifying 298 times.

"On putting my eye to the telescope, I was forcibly struck by the beauty of the image, and set myself diligently to observe whatever might present itself. The annexed diagram† is an attempt to represent the planet, with especial reference to an unusual appearance which attracted my eye. After surveying the planet for some time, I was struck with a remarkable phenomenon, which, referring to the diagram, I shall proceed, as well as I can, to describe.

"It appeared as if something like a *crape veil* covered a part of the sky within the inner ring, designated by the letter (*a*). This extended about half way between what I should have formerly considered the inner edge of the inner ring and the limb of the planet, while there was a darker, ill-defined boundary line (*b*) separating this crape-like appearance from the solid body of the inner ring. There was an exceedingly thin line, or shadow, running along the southern edge of the northern portion of the ring where it crossed the planet, and this line seemed somewhat broader at each end, where it touched the limbs of the planet. Mr. Dawes had previously drawn my attention to the appearance of this line before scrutinising the planet."

Extract of a Note from Mr. Hind to the Astronomer Royal.

"Mr. Lassell will probably have written to you relative to a new appearance about *Saturn*, probably the same as that from which Professor Bond has inferred the existence of an interior ring, according to extracts from Boston newspapers, which have been copied into the London daily journals.

* The *independence* of the Wateringbury Observations is of little importance in this case, as Messrs. Dawes and Lassell are too accomplished and experienced observers to see what they wish to see. Their testimony to Mr. Bond's discovery has, however, additional interest and value from this cause.

† This diagram is not given, as it was thought better to make use of a more finished portrait by Mr. Dawes. The letters *a* and *b* refer to the outer and inner edges of Mr. Bond's ring.

"Last evening, about nine o'clock, I had an excellent view of the planet under magnifying powers of 200 and 320, and on careful examination I noticed, chiefly on the side following in right ascension, a faintly illuminated border of light, partly filling up what usually appears to be the black ground of the heavens between the ball and interior edge of inner ring. Its breadth seemed to me about half that of the outer ring, and though I could not discern anything like a division between the faint light and the interior edge of the ring, this might very possibly be owing to want of higher power, which the night did not bear advantageously. The inner edge was *at times* very well defined. The appearance was steadily visible on the side following in right ascension, but I could only perceive it by momentary glimpses on the preceding one. Mr. Lassell's account of his observations upon *Saturn* with Mr. Dawes' refractor, Dec. 3, is perfectly in accordance with the phenomenon I have alluded to above. My observation is therefore merely in consequence of this notification from Mr. Lassell."

A very beautiful drawing of *Saturn*, by Mr. De la Rue, as seen in his 13-inch reflector, will be exhibited at the January meeting. It fully confirms Mr. Bond's discovery, and Mr. Dawes' sketch.

On the Ring of Saturn. By the Rev. W. R. Dawes.

"After the re-establishment of my observatory at my present residence, until the last week in November, the state of the air was very unfavourable for observation. During that week and the first of this month, some good opportunities have occurred; and I beg leave to lay before the Society a few extracts from my observatory journal relating to the telescopic appearances of the ring of *Saturn*, which have been in some respects remarkable.

"1850, Nov. 23. With $8\frac{1}{2}$-foot equatoreal refractor. *Saturn;* power 125. Very brilliant and sometimes sharply defined. Now and then fancied a faint lucid point near the following arm of the ring; but it was not satisfactorily verified with 425. While looking steadily for it (with power 425) some very good views of the planet occurred, and I sometimes suspected that the outer ring had a short and narrow line upon it near its extremity. On scrutinising the preceding arm, I occasionally get the same impression. *Query*, Is the division in the outer ring becoming visible again? *Mem. Ask Lassell to look for it.*"

The following morning I received a letter from Mr. Lassell, dated Nov. 22, in which he says: "Last night, in about a single hour of *fine* sky, I was favoured with a view of *Saturn*, accompanied by his eight satellites; some of them in trying positions." Then follows a diagram of their positions in reference to the planet, at $8^h\ 40^m$ G. M. T.; and also a larger diagram of the planet itself. Mr. Lassell then adds: "I had repeated impressions of a secondary division; and, if it be real, it is one-third of the breadth of the outer ring from its outer edge. The suspicion was the same from both ansæ .... Powers from 219 to 614; full aperture always:" viz. 24 inches.

To proceed with the extracts from my journal.

" Nov. 25. Clear night, and occasionally good telescopic vision. *Saturn.* With 282, I was satisfied that, in finest moments, a very narrow and short line was discernible on the outer ring near its extremities; which was confirmed with power 425, with which the phenomena of the planet were better brought out.

" Nov. 29. Sharp frost; clear sky. *Saturn*, 6^h 45^m G. M. T. Having applied higher powers, and viewed the planet steadily for a considerable time, I obtained several satisfactory glimpses of a division near the extremity of the outer ring. It was occasionally seen with power 323; but far more certainly with 460. After a few seconds of uncommonly sharp vision, I involuntarily exclaimed, '*Obvious.*' There is a *shading*, like *twilight*, at the inner portions of the inner ring, 7^h 30^m. On looking again at *Saturn*, power 460, I am struck with the beauty of the image, and get frequent glimpses of the division in the outer ring: it is improved by a little illumination of the field, and is usually rather best seen at the *following* extremity.

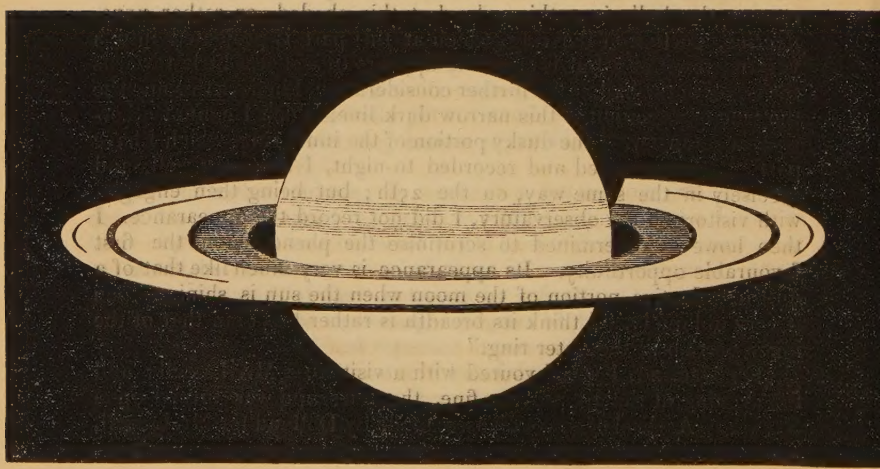
" 8^h 40^m. Examined *Saturn* with the Dollond micrometer and Barlow lens, power 375. Vision is occasionally fine. At times I am pretty sure of the lines on the extremities of the outer ring; but rather most so on the *following* side. The preceding extremity seems rather more dusky than the following one, and scarcely so distinct. There is an exceedingly narrow black line on the ball at the *southern* edge of the ring where it crosses the planet; and it is slightly broader at the east and west edges of the ball than near its middle. It is perhaps one-third the breadth of the shadow of the ring on the ball to the *north* of the ring. What can it be? It looks like a shadow; but how can the shadow of the ring be visible both on the north and south sides of it?

" 8^h 55^m. The interior portion of the inner ring is rather *suddenly* shaded off, and towards the inner *edge* scarcely reflects sufficient light to be always sure of its outline. It has struck me, that the dark line which I see at the southern edge of the ring where it crosses the ball, is nothing else but this shaded, or rather *unreflective*, portion of the ring, which at this part is projected into a very narrow line: but it certainly appears to widen a little towards the edges of the ball. On further consideration, I believe this must be the true explanation of this narrow dark line, which I cannot otherwise account for. The dusky portion of the inner ring, which I have particularly described and recorded to-night, I saw very well, and precisely in the same way, on the 25th; but being then engaged with visitors to the observatory, I did not record the appearance. I then however determined to scrutinise the phenomenon the first favourable opportunity. Its appearance is very much like that of a dull unreflective portion of the moon when the sun is shining upon it very obliquely. I think its breadth is rather less than that of the inner portion of the outer ring."

On Dec. 2d, I was favoured with a visit from Mr. Lassell; and the evening of the 3d proving fine, the telescope was turned upon *Saturn*. A wheel of convex lenses, made by Dollond for Mr. Lassell,

was applied to the telescope; and with these the planet was subjected to a careful scrutiny: immediately after which, Mr. Lassell made the following entry in my observatory journal, accompanied by a sketch of the planet; "1850, Tuesday Dec. 3; $9^h\ 15^m$ G. M. T. *Saturn:* $8\frac{1}{2}$-foot achromatic, powers 298 and 363. I find I cannot do justice to the view of the planet; but the phenomenon which struck me as most peculiar was, that the space between the inner diameter of the inner ring and the ball was bisected, or rather half covered, by an appearance as if a crape veil had been thrown over it. There is a dark inner edge to the bright ring, which shades off a little, the dark ring is then of a uniform grey colour: the sky is seen black between Bond's ring and the planet. The belt on the equator of *Saturn* was ruddier than the southern portion, but scarcely more marked;—there being a most striking difference of colour between the whole district south of the northern edge of the belt, and the portion north of that line. I am not certain that I saw any secondary division of the ring. A minute dark line or shadow I also observed running along the southern edge of the ring, where it crossed the front of the ball; and this line was rather broader at its ends, projected on the limbs of *Saturn*, than in the middle." "[This last sentence added on the morning of the 4th, having forgotten to record it at the time.—W. Lassell."]

"Dec. 5, at 7^h G. M. T. Generally star-light, but rather hazy and dull. *Saturn.* The haze is rather too thick for the use of high powers, but during clearer moments, 323 is borne very well; and the definition, though variable, is at times very good. The *obscure ring* is occasionally well seen. I get an impression of a dark shade immediately in contact with the bright ring, but not amounting to black, and certainly not *so* black as the principal division in the ring; yet it is, I think, nearly as broad. Then comes a faintly illuminated ring concentric with the bright one. Its breadth is about equal to the inner portions of the outer ring.



"7^h 30^m. The planet is a little clearer, and bears 460 very well. With this power, by occasional good views, the phenomena come out more decidedly than with 323 .... I cannot distinctly make out any division in the outer ring. On comparing the breadth of the dark shade south of the ring, with the breadth of the obscure portion of the inner ring as seen at the ansæ, it seems to agree in its proportions with the elliptic form of the ring; and I cannot doubt that it is that obscure portion projected on the ball."

A sketch by Mr. Dawes of the appearance of the planet and its rings as subsequently seen by him, is represented in the annexed woodcut. This is only to be considered as an *illustration*, for neither the time nor the material allowed of any very careful rendering. The upper shadings on the body of the planet are incorrect, and may be considered as non-existing.

Remarks on the foregoing extracts.

"1. With reference to the division in the outer ring. It would seem too improbable that the same impression should be received by two observers, in different localities, without previous communication on the subject, and using instruments so different in character as Mr. Lassell's twenty-foot reflector and my refractor, unless there were some real ground for it; and it is therefore very desirable that this point should be carefully examined on every favourable opportunity by those who possess telescopes competent to the work. Very distinct definition with a power of 300 or 400 times is requisite to show it, and the primary division of the ring must appear black and clear. It is worthy of notice too, that on Nov. 23, when I first observed it, I was engaged in looking for a suspected close satellite, and was not examining the ring, or thinking at all about it. The dark line at the extremity of the outer ring obtruded itself several times upon my notice; and after continued scrutiny with power 425, I remained satisfied of its existence. Of course, a very slight disturbance of the image is sufficient to obliterate the appearance, and the impression was obtained from several fine sharp glimpses of only a few seconds in duration,—grievously tantalising indeed, yet quite sufficient to produce conviction. It is true, that this appearance is not always visible, even under favourable atmospheric circumstances; but it is quite possible that this may be a necessary consequence of the condition of the rings themselves.

"2. The appearance of the interior portion of the ring is very different from what I have ever seen before with this or any other telescope. The shading-off of the ring strikes me as far more decided and abrupt, and also as very much darker, than it used to be. Moreover, the interval between the inner edge of the ring and the ball, as I have been accustomed to view it, and as it has been usually depicted, is now encroached upon by what appears like a very faint continuation of the breadth of the inner ring, occupying, perhaps, about four-tenths of the interval between the edge of the ball and the interior boundary of the bright part of the ring. My tele-

scope does not indicate to me that this interior portion is *separated* from the bright ring; for the line of demarcation between them is not so black as the principal division in the ring. It looks rather as though the more diffused shading, or belt, which alone was formerly visible on the interior portion of the bright ring, had contracted into a narrower compass, and become of a far deeper shade.

"It may, perhaps, be worthy of consideration, whether the fact of the total absence of sunshine for fifteen years on the southern side of the ring, from which state it has so recently emerged, may have had any effect in producing the present appearances; and it will be highly interesting to observe whether they become modified as the sun rises higher above the plane of the ring, and as the breadth of the ellipse increases. It must be acknowledged, however, that the circumstances of the planet were in this respect the same in 1791 and the following years, when Sir W. Herschel paid so much attention to its phenomena. In a paper read before the Royal Society, January 23, 1794, he thus sums up the appearances of the double ring:—'The outer ring is less bright than the inner ring. The inner ring is very bright close to the dividing space; and at about half its breadth it begins to change colour, gradually growing fainter; and just upon the inner edge it is almost of the colour of the dark part of the quintuple belt.'

"As Mr. Bond's observations were made with an instrument so superior to mine, and under remarkably favourable circumstances, it is quite possible that they may place the phenomena in a very different light. As however all my observations, with the exception of those on the 5th, were made in total ignorance of any remarkable appearances having been noticed by any other observer, I have thought it desirable to request the Society's acceptance of them.

"That the appearances which have lately forced themselves on my attention when viewed through a telescope of moderate dimensions should not have been noticed by previous observers employing far larger instruments, seems to furnish additional evidence of recent change. Sir W. Herschel diligently observed this planet; yet only on four occasions did he notice anything remarkable in the interior portion of the ring, beyond slight shading off, which is represented in one of his figures of the planet, but is not thought worthy of more particular description than that quoted above. Professor Struve remarks (*Memoirs of the Astronomical Society*, vol. ii. page 517): 'As to a division of the ring into many parts, I have noticed no trace. It is remarkable that the outer ring is much less brilliant than the inner. The inner one, too, towards the planet, seems less distinctly limited, and to grow fainter, so that I am inclined to think that the inner edge is less regular than the others.' At that time the same side of the ring was presented to our view as at present; and the ring was so open that the north pole of the planet was hidden by it. Neither did Sir J. Herschel at the Cape of Good Hope notice anything like the present appearances, though *Saturn* was nearly in the zenith, and the climate so favourable.

"No night has occurred since the 5th of sufficiently fine quality to permit micrometrical measures to be taken of the different portions of the ring; but these I shall endeavour to procure the first opportunity."

VICTORIA.

Some objection has been taken, though, we believe, only by one or two persons in the United States, to the name of *Victoria*, as applied to the new planet discovered by Mr. Hind.* It seems to have been forgotten that her Majesty's name is derived from the goddess, who cannot thereby lose her celestial rights. Victoria was recognised as a deity by those who deified Egeria, &c. "Video Virtutis templum .... Quid Opis, quid Salutis, quid Concordiæ, Libertatis, Victoriæ."—*Cicero de Nat. Deor.* lib. ii. § 23.

The following extract from Mr. Hind to the Astronomer Royal will show that there is no intention of changing the name:—

"Since I received your letter of Oct. 1, I have never entertained the slightest idea that any other name than *Victoria* would be employed in Europe, and consequently have fully intended to adhere to it myself. I am quite sure Mr. Bishop is of the same intention. Professors Schumacher, Gauss, Encke, and Argelander, have adopted this name without hesitation; the only opposition that I am aware of has been offered by a part of the American body of astronomers; and I hope, in course of time, for the sake of uniformity, they will use the European name."

The following note from the Hon. Edward Everett to Captain Smyth relates to the same subject:—

"I perceive that Mr. Hind has received the impression from Mr. Gould (editor of the *Astronomical Journal*), that the American astronomers were not disposed to acquiesce in the name of *Victoria*, proposed by him for the last asteroid. When that name was first proposed, it was considered by some persons to be inconsistent with the principle which had been agreed upon, in reference to the designation of newly-discovered bodies. But as Mr. Hind states that he regards '*Victoria*,' in this connexion, as the name of a mythological personage, I cannot think that its coincidence with that of your sovereign ought to forbid its use. Mr. Bond fully agrees with me in this opinion; and there is no one in this country of higher authority than he on any astronomical question."

* M. Gasparis has a great advantage in having at his choice local deities, Parthenope, Egeria, Ilia, &c., which link the country of the discoverer with his discovery. We ultramontanes have no similar good fortune, unless, as in the present case, the sovereign should bear the name of a goddess.

CAMBRIDGE. On the Meridian. (Professor Challis.)

1850.	Green. M.T. h m s	R.A. h m s	N.P.D. ° ′ ″	Log $\frac{q}{P}$	Obs.—Calc. R.A. s	Obs.—Calc. N.P.D. ″
Sept. 18	11 50 4·7	23 40 36·48	76 38 6·2	−9·7948	−0·26	−2·1
21	35 51·8	38 10·89	77 7 32·4	·7995	−0·13	+0·5
25	17 1·8	35 3·99	77 49 4·0	·8058	+0·34	−0·8
28	11 3 2·6	32 52·13	78 21 28·5	·8106	−0·28	−1·7
Oct. 1	10 49 12·9	30 49·84	78 54 34·1	·8156	−0·25	+0·2
2	44 38·8	30 11·53	79 5 40·6	·8171	−0·21	+1·0
5	31 4·5	28 24·65	79 38 57·8	·8219	−0·29	+0·5
7	22 9·2	27 20·97	80 1 2·4	·8249	−0·17	+1·0
8	17 44·3	26 51·87	11 56·4	·8265	+0·25	−2·1
11	4 37·8	25 32·90	44 20·5	·8310	−0·19	−0·1
12	10 0 19·9	25 10·92	80 54 55·7	·8324	+0·55	−0·1
17	9 39 13·3	23 43·55	81 45 50·6	·8392	−0·26	−0·8
26	9 3 11·3	23 4·58	83 6 24·6	·8496	+0·28	−6·7
29	8 51 42·8	23 23·94	29 35·5	·8525	−0·44	−2·8
Nov. 2	36 51·7	24 16·57	83 57 17·2	·8559	+0·08	−0·6
4	29 36·7	24 53·49	84 9 36·7	·8574	−0·29	−5·1
5	26 1·1	25 13·88	15 27·8	·8581	−0·29	−4·3
8	8 15 26·3	26 26·93	31 32·2	·8600	−0·34	−3·7
14	7 55 0·7	29 37·36	84 57 9·4	·8631	+0·09	−2·3
23	26 0·2		85 19 51·1	−9·8657		−0·2
29	7 7 37·9	23 41 15·13			+0·28	

"The observations generally were uncertain on account of the faintness of the planet. On Nov. 2 it was brighter than usual. The places are compared with M. Yvon Villarceau's Ephemeris, in No. 741 of the *Astronomische Nachrichten*."

Northumberland Equatoreal.

1850.	Green. M.T. h m s	R.A. h m s	Log $\frac{p}{P}$	N.P.D. ° ′ ″	Log $\frac{q}{P}$	No. of Comps.	Stars
Sept. 16	14 39 53·9	23 42 8·93	+8·434	76 20 34·1	−9·8154	1	(*a*)
	15 10 52·8	8·58	+8·495	40·8	−9·8244	3	(*b*)
Dec. 19	7 20 42·4	0 3 14·25	+8·092	84 54 2·3	−9·8642	5	(*c*)
20	7 49 22·9	0 4 30·42	+8·245	84 50 41·6	−9·8655	8	(*d*)

Assumed *Apparent* Places of the Stars.

	R.A. h m s	N.P.D. ° ′ ″	Authority.
(*a*)	23 48 27·44	75 59 25·2	B. (Weisse) xxiii. 992
(*b*)	23 37 52·59	76 9 3·1	— — 776
(*c*)	0 5 8·26	84 39 12·4	— O. 83
(*d*)	0 5 41·19	84 40 5·0	— O. 95

"A comparison with M. Villarceau's ephemeris gives the following results:—

	Obs. R.A. s	Calc. N.P.D. ″
Sept. 16	−0·04	−3·4
Dec. 19	+0·56	5·7
20	+0·41	−8·3

giving to the sets of Sept. 16, weights proportional to the number of observations."

LIVERPOOL. Equatoreal. (Mr. Hartnup.)

1850.	Green. M.T. h m s	R.A. h m s	N.P.D. ° ′ ″	Comp^{d}—Obs^{d} R.A. s	Comp^{d}—Obs^{d} N.P.D. ″	Star of Comp.	
Nov. 14	6 57 29·8	23 29 36·23	84 56 55·2	−0·40	+3·8	B.A.C.	8177
16	7 34 48·5	30 52·88	85 3 38·3	0·41	5·2	—	—
27	6 6 9·7	39 23·42	24 2·4	0·41	5·1	—	8233
28	9 55 11·0	40 26·36	24 42·8	0·50	4·2	—	—
29	7 27 27·7	41 16·23	25 0·7	0·60	5·7	—	—
Dec. 5	6 49 18·1	47 9·91	23 6·7	0·48	6·4	—	—
9	5 48 25·5	51 24·62	18 12·2	0·61	6·1	—	—
11	9 44 51·6	53 50·04	14 22·7	0·57	4·4	—	—
12	6 15 26·6	54 48·62	12 35·5	0·60	7·5	—	—
13	9 40 17·6	23 56 7·77	85 10 4·9	0·47	7·9	—	8233
19	6 11 13·2	0 3 10·86	84 54 8·4	0·70	5·4	—	8331
21	8 39 33·5	0 5 48·95	84 47 10·1	−0·62	+7·1	—	—

The observed places are corrected for refraction and parallax.

The parallax and computed places were deduced from M. Yvon Villarceau's ephemeris, contained in the *Astronomische Nachrichten*, No. 741.

The following are the assumed *mean* places of the stars of comparison for 1850·0.

	R.A. h m s	N.P.D. ° ′ ″	Authority.		
8177 B.A.C.	23 20 21·62	84 26 40·00	Greenwich 12-year Catalogue.		
8233* —	23 32 14·15	85 11 10·71	—	—	—
8331 —	23 51 36·64	83 58 1·79	—	—	—

The right ascension of 8233 from Greenwich Observations for 1848; the north polar distance from Greenwich Twelve-year Catalogue.

"The following results are derived by comparison of the observations, page 5, with the ephemeris of M. Villarceau, after correcting the places for the erroneous assumed value of B.A.C. 8233.

1850.	Ephem. R.A. s	Obs. N.P.D. ″	1850.	Ephem. R.A. s	Obs. N.P.D. ″
Sept. 17	+0·04	+5·5	Oct. 11	+0·01	−0·9
21	·03	+1·0	21	+0·04	+2·0
26	·06	+0·5	23	−0·11	−0·2
28	·20	−0·3	26	−0·01	−0·3
Oct. 1	·27	+1·3	Nov. 2	−0·23	+2·5
4	·13	+0·3	8	−0·21	+3·2
Oct. 5	+0·09	+1·1	Nov. 12	−0·25	+3·8

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* "The assumed mean places of B.A.C. 8233, or γ *Piscium*, at page 5, was deduced from the annual proper motion given in that catalogue. I have now adopted the Greenwich right ascension in 1848 brought up with the annual variation from the same authority. The former mean right ascension for 1850 was assumed = $23^{h}\,32^{m}\,14^{s}\cdot40$."

HAMBURG. (M. Rümker.)

1850.	Hamburg M.T. h m s	R.A. ° ′ ″	Decl. ° ′ ″	
Nov. 9	8 12 27·7	351 43 34·9	+5 23 49·6	Mer.
12	8 2 12·5	352 6 47·8	10 32·5	Mer.
	8 8 2·7	52·0	30·5	Eq.
13	8 43 16·8	15 28·7	5 6 31·3	—
15	8 54 55·2	33 54·7	4 59 17·0	—
16	9 12 24·7	352 43 39·1	56 18·4	—
28	8 51 24·5	355 5 39·1	35 13·6	—
29	6 21 4·7	18 1·4	34 53·9	—
30	7 5 6·9	355 32 33·2	+4 35 2·2	Mer.

Apparent place of a star of comparison from meridian observation.

1850. Nov. 29 App. R.A. = 23 h 42 m 22·63 s App. Dec. +4 ° 34 ′ 14·1 ″

HAVERHILL. (Mr. W. W. Boreham.)

1850.	G.M.T. h m s	R.A. h m s		N.P.D. ° ′ ″		Star of Comp. Weisse.
Oct. 1	11 20 42	23 30 49·17	+0·006 *p*	78 54 50·3	−0·657 *p*	xxiii. 647
2	10 26 53	30 12·56	−0·0004 *p*	79 5 34·2	−0·659 *p*	— 610
5	8 36 57	28 27·02	−0·045 *p*	79 38 3·1	−0·678 *p*	— 570
16	8 39 24	23 58·07	−0·012 *p*	81 35 32·5	−0·694 *p*	— 421
17	7 32 15	23 23 44·92	−0·02 *p*	81 45 5·07	−0·706 *p*	xxiii. 421

Comparison with the Ephemeris of M. Y. Villarceau.

	Observation—Calculation. R.A. s	N.P.D. ″		Observation—Calculation. R.A. s	N.P.D. ″
Oct. 1	−0·40	+ 6·6	Oct. 16	−0·42	+ 5·8
2	+0·01	+ 6·5	17	−0·45	+10·5
5	−1·33	−21·5			

WASHINGTON. Equatoreal. (Lieut. Maury.)

1850.	Washington M.T. h m s	Obs.	Star.	R.A. h m s	Dec. ° ′ ″
Oct. 28	10 11 13·7	10	*a*	23 23 18·63	+6 35 47·4
29	8 44 58·6	10	Santini 1636	23 26·60	+6 28 46·4
	9 16 40·4	4	*a*	27·05	41·9
31	7 39 36·4	14	Santini 1636	23 49·19	+6 14 52·1
	10 13 1·8	4	— —	50·61	8·9
Nov. 1	7 33 40·9	14	— —	24 3·52	+6 8 9·3
	8 28 54·9	6	— —	4·00	7 54·3
2	8 15 7·6	5	— —	24 20·08	+6 1 26·8
	9 0 1·5	5	— —	20·45	14·9
4	8 16 7·7	11	*b*	24 57·96	+5 49 9·2
	8 53 47·7	5	—	58·68	48 59·2
5	7 48 52·7	4	B.A.C. 8177	23 25 18·56	+5 43 26·8
	7 52 26·8	6	Weisse, xxiii. 458	18·73	25·9

Adopted Mean Places for 1850·0 *of Comparison-Stars.*

Star.	Mag.	R.A. h m s	Dec. ° ′ ″	Authority.	No. of Comp.
a	9·10	23 25 0·74	+6 41 13·7	Comp^{d}. with Weisse, xxiii. 452.	8
Santini 1636*	7·8	24 35·10	+6 15 31·8	Santini, Mem. R.A. Soc. vol. xii. p. 273.	
b	9·10	25 32·76	+6 1 38·0	Comp^{d}. with Santini, 1636.	10
B.A.C. 8177	5	20 21·69	+5 33 21·1	Brit. Ass. Cat.	
Weisse, xxiii. 458	8·9	23 22 44·27	+5 35 58·2	Weisse.	

Ephemeris. By M. Yvon Villarceau.

(Extracted from *Comptes Rendus*, No. 20, Nov. 11, 1850, p. 681.)

For Paris Mean Noon.

1850.	R.A. h m s	Decl. ° ′ ″	Log. Δ
Dec. 1	23 42 51·38	+4 34 43·5	0·21053
2	43 49·76	34 53·3	·21415
3	44 49·23	35 14·8	·21776
4	45 49·76	35 47·8	·22135
5	46 51·34	36 32·0	·22493
6	47 53·93	37 27·5	·22850
7	48 57·53	38 33·9	·23206
8	50 2·10	39 51·1	·23560
9	51 7·61	41 18·8	·23912
10	52 14·06	42 57·0	·24263
11	53 21·42	44 45·3	·24612
12	54 29·65	46 43·7	·24960
13	55 38·76	48 51·9	·25306
14	56 48·72	51 9·7	·25650
15	57 59·50	53 37·0	·25991
16	23 59 11·09	56 13·4	·26332
17	0 0 23·46	+4 58 58·9	·26670
18	1 36·60	+5 1 53·3	·27007
19	2 50·50	4 56·4	·27342
20	4 5·12	8 7·9	·27675
21	5 20·47	11 27·8	·28006
22	6 36·51	14 55·8	·28335
23	7 53·24	18 31·7	·28662
24	9 10·66	22 15·5	·28988
25	10 28·74	26 6·9	·29311
26	0 11 47·47	+5 30 5·8	0·29632

* This star is the same as xxiii. 532 of Weisse's Catalogue, and is from Bessel's Zone 38. There is an error of one minute of time in the right ascension in Weisse; this has been made in the reduction from Bessel. The mean place for 1850·0 is as given above.

1850.	R.A. h m s	Decl. ° ′ ″	Log Δ.
Dec. 27	0 13 6·85	+5 34 12·0	0·29952
28	14 26·86	38 25·4	·30269
29	15 47·49	42 45·8	·30585
30	17 8·72	47 13·2	·30898
31	18 30·54	51 47·3	·31209
32	0 19 52·95	+5 56 28·0	0·31519

EGERIA.

HAMBURG. (M. Rümker.)

1850.	Green. M.T. h m s	R.A. ° ′ ″	Decl. ° ′ ″	
Nov. 15	7 18 10·7	27 9 38·5	+8 24 1·7	Eq.
	10 10 5·9	7 52·5	21·7	Mer.
16	7 0 29·4	26 56 8·7	26 28·3	Eq.
20	9 24 39·0	26 3 31·6	37 48·4	—
25	9 22 8·2	25 8 2·7	54 11·4	—
26	6 59 15·4	24 59 12·0	57 18·4	—
	9 18 14·2	58 16·9	8 57 48·8	Mer.
28	6 12 22·6	24 40 53·2	9 4 30·4	Eq.
29	8 56 44·0	24 31 12·2	8 49·5	—
30	6 46 4·5	24 23 42·3	+9 12 43·1	—

"*Apparent* places of comparison stars derived from observations with the meridian circle."

1850.	App. R.A. h m s	App. Decl. ° ′ ″
Nov. 16	1 46 57·03	+8 27 23·2
	1 52 52·08	8 29 12·0
26	1 46 31·14	8 47 42·0
	1 46 17·54	8 51 50·5
29	1 42 25·55	+9 4 5·7

Elements. By Mr. George Rümker.

	(1.) From obs., Naples, Nov. 2; Hamburg, 20th; Altona, 13th.	(2.) Naples, Nov. 2; Hamburg, Nov. 29, Dec. 26.	
	° ′ ″		° ′ ″
M.....	288 37 17·1	Nov. 2·0	298 41 31·87 Jan. 0, 1851
π	116 26 49·4	.....	119 40 8·02
Ω ...	43 35 24·4	.....	43 20 19·06
i	15 57 59·8	.....	16 26 49·33
φ	5 31 9·4	.....	5 4 11·00
e	0·0961805	.....	0·0883679
μ	866″·2216	..... log μ	2·9350437
Log *a*	0·4082517	....	0·4099753

For Greenwich Mean Time and to Mean Equinox, 1851·0.

Nov. 29, Calcul.—Observ. = +0″·10 in Long. +0″·02 in Lat. by 2d Elements.

LIVERPOOL. Equatoreal. (Mr. Hartnup.)

1850.	Greenwich M.T.	R.A.	Log $\frac{p}{P}$	N.P.D.	Log $\frac{q}{P}$	Star of Comp.
	h m s	h m s	s	° ′ ″	s	
Nov. 27	7 57 44·5	1 39 16·35	−8·179	80 58 46·8	−9·8467	B.A.C. 488
	8 17 40·9	15·82	−8·072	44·0	9·8449	— —
	8 37 37·6	15·29	−7·924	40·5	9·8437	— —
28	10 30 43·5	1 38 36·11	+8·084	80 54 38·0	9·8445	— —
	10 50 40·0	35·75	+8·189	35·4	9·8464	— —
	11 10 36·7	35·13	+8·270	32·6	9·8484	— —
29	8 26 35·2	1 38 4·82	−7·941	80 51 5·7	9·8429	— —
	8 46 31·8	4·39	−7·721	2·9	9·8419	— —
Dec. 5	8 9 39·5	1 35 15·31	−7·857	80 25 51·6	9·8390	— —
	8 47 3·2	14·64	−6·723	44·1	9·8381	— —
6	7 25 57·9	1 34 53·95	−8·140	80 21 24·4	9·8413	— —
	7 45 54·7	53·62	−8·019	17·2	9·8396	— —
9	6 33 22·0	1 33 59·66	−8·306	80 7 7·9	9·8441	— —
	6 48 19·5	59·52	−8·252	1·7	9·8422	— —
11	10 50 19·2	1 33 29·19	+8·381	79 56 5·0	9·8468	— —
	11 5 16·8	29·27	+8·417	0·7	9·8495	— —
13	11 20 2·6	1 33 9·18	+8·464	79 45 18·4	9·8528	— —
	11 35 0·3	9·08	+8·490	13·6	9·8559	— —
19	7 34 41·2	1 32 52·82	−7·503	79 12 4·5	9·8284	— —
	7 52 38·4	52·79	Mer.	11 57·2	9·8282	— —
21	9 24 37·4	1 33 1·15	+8·234	78 59 27·3	9·8332	— —
	9 39 35·2	1·02	+8·290	23·8	−9·8354	— —

"The observations are corrected for refraction. The corrections to be applied for parallax in time and arc are represented by p and q. P is the equatoreal horizontal parallax."

"The following is the assumed *mean* place of the star of comparison for 1850·0, derived from the Greenwich 12-year catalogue."

	R.A.	N.P.D.
	h m s	° ′ ″
B.A.C. 488	1 29 9·16	78 37 38·80

The errors of Rümker's Ephemeris by the Liverpool observations are as follow.

	Computed—Observed. R.A.	N.P.D.
	s	″
1850. Dec. 19	+11·11	−62·7
21	+12·77	−72·4

CAMBRIDGE. On the Meridian. (Professor Challis.)

1850.	Greenwich M.T.	R.A.	N.P.D.	Log $\frac{q}{P}$
	h m s	h m s	° ′ ″	
Nov. 23	9 31 33·8	1 41 55·35	81 12 33·9	−9·8348
25	22 18·1	40 31·26		
28	8 37·7		80 54 40·7	−9·8324
29	9 4 7·5	38 3·89	80 50 46·7	−9·8319
Dec. 7	8 29 10·9	1 34 34·00		

"Obtained with difficulty, the planet being very faint."

Northumberland Equatoreal.

1850.	Green. M.T. h m s	R.A. h m s	Log $\frac{p}{P}$	N.P.D. ° ′ ″	Log $\frac{q}{P}$	No of Comps.	Star.
Nov. 21	11 57 6·1	1 43 21·00	+8·366	81 18 38·7	−9·8457	10	(*a*)
25	10 36 54·1	40 29·11	+8·122	81 5 31·9	−9·8371	4	(*b*)
Dec. 5	10 50 34·5	1 35 12·09	+8·358	80 25 9·2	−9·8392	8	(*c*)

Assumed *Apparent* Places of the Stars.

	R.A. h m s	N.P.D. ° ′ ″	Authority.
(*a*)	1 41 19·77	81 28 9·6	B. (Weisse) i. 743
(*b*)	41 23·09	81 3 32·1	Cambridge Observation.
(*c*)	1 34 43·38	80 30 28·0	— —

"The star (*c*) is Bessel i. 633. The assumed place of each of the stars (*b*) and (*c*) depends on one transit and one circle observation."

Ephemeris. By M. G. Rümker.

For Greenwich Mean Noon.

1850.	App. R.A. h m s	App. Decl. ° ′ ″	Log. Dist. from Earth.
Dec. 8	1 34 25·15	+9 47 11·9	0·23615
9	34 8·45	9 52 7·5	
10	33 53·63	10 57 9·6	
11	33 40·68	2 18·3	
12	33 29·59	7 33·2	0·24578
13	33 20·34	12 54·6	
14	33 12·93	18 22·3	
15	33 7·35	23 56·2	
16	33 3·59	29 36·2	0·25570
17	33 1·62	35 22·3	
18	33 1·45	41 14·3	
19	33 3·05	47 12·2	
20	33 6·41	53 16·0	0·26584
21	33 11·51	10 59 25·6	
22	33 18·34	11 5 40·9	
23	33 26·89	12 1·8	
24	33 37·14	18 28·3	0·27612
25	33 49·09	25 0·3	
26	34 2·72	31 37·6	
27	34 18·02	38 20·3	
28	34 34·97	45 8·4	0·28646
29	34 53·55	52 1·7	
30	35 13·75	11 59 0·1	
31	35 35·55	12 6 3·6	
1851. Jan. 1	35 58·93	13 12·1	0·29681
2	36 23·88	20 25·6	
3	36 50·38	27 43·9	

1851.	App. R.A. h m s	App. Decl. ° ′ ″	Log Dist. from Earth.
Jan. 4	1 37 18·42	+12 35 6·9	
5	37 47·98	42 34·6	0·30711
6	38 19·04	50 6·9	
7	38 51·58	12 57 43·8	
8	39 25·57	13 5 25·0	
9	40 1·00	13 10·5	0·31730
10	40 37·84	21 0·2	
11	41 16·08	28 54·0	
12	41 55·70	36 51·8	
13	42 36·68	44 53·5	0·32734
14	43 18·98	13 52 58·9	
15	44 2·59	14 1 7·9	
16	44 47·49	9 20·4	
17	1 45 33·65	+14 17 36·4	0·33720

For comparing with observation, the time due to aberration must be applied to Greenwich Mean Noon.

An ephemeris by M. Vogel of Berlin, on the *same elements* was very kindly communicated by Dr. Petersen. We give the latter portion of it as a finding ephemeris :—

For 8 p.m. Berlin Mean Time.

1851	R.A. h m s	Decl. ° ′	1851.	R.A. h m s	Decl. ° ′
Jan. 17	1 45 48	+14 20·1	Feb. 4	2 3 6	+16 57·2
18	46 35	28·5	5	4 14	+17 6·3
19	47 24	36·9	6	5 22	15·5
20	48 14	45·3	7	6 32	24·7
21	49 6	+14 53·8	8	7 43	33·9
22	49 59	+15 2·3	9	8 55	43·1
23	50 53	10·0	10	10 8	+17 52·3
24	51 48	19·5	11	11 23	+18 1·5
25	52 44	28·2	12	12 38	10·8
26	53 41	36·9	13	14 53	20·1
27	54 39	45·7	14	15 8	29·4
28	55 38	+15 54·5	15	16 25	38·7
29	56 39	+16 3·4	16	17 43	48·0
30	57 41	12·3	17	19 2	+18 57·3
31	58 44	21·2	18	20 22	+19 6·6
Feb. 1	1 59 48	30·1	19	21 42	15·9
2	2 0 53	39·1	20	23 4	25·2
3	2 3 59	+16 48·1	21	2 24 26	+19 34·5

Log Δ.

Jan. 15	0·3330	Jan. 31	0·3706	Feb. 12	0·3961
19	0·3427	Feb. 4	0·3794	16	0·4040
23	0·3523	8	0·3879	20	0·4116
27	0·3616				

METIS.

Extract of a Letter from Mr. Graham, 16 October, 1850.

"A meridian observation of *Metis*, obtained here on the 11th, has fully confirmed what I had previously good reason to suppose, that my last published elements of the planet are much wider from the truth than the previous ones.

"The observation gives,—

1850.	G.M.T. h m s	R.A. h m s	Decl. ° ′ ″
Dec. 11	17 9 59·8	9 58 22·72	+18 55 15·0

Corrected for Parallax, not for Aberration.

"This differs nearly 7^s in right ascension, and 23″ in declination from the place deduced from the elements.

"As the observation was satisfactory, I set to work without delay, and have obtained the following set of elements,—

To Mean Equinox of Epoch 1848, May 0·0,

	° ′ ″
M	144 19 41·25
$\pi - \Omega$	2 33 24·33
Ω	68 27 46·76
i	5 35 48·03
φ	7 3 27·32
μ'	962″.6884

"These are for the instantaneous ellipse at epoch.

"The places from which these are deduced are the two of 1848, May 15·0, and 1849, Aug. 31·5, previously made use of, and the meridian observation given above, viz.,—

Greenwich M.T.	Long. ° ′ ″	Lat. ° ′ ″
1848, May 15·0	220 37 11·17	+3 26 7·805
1849, Aug. 31·5	327 9 39·75	−9 29 37·54
1850, Dec. 11·70619	145 8 43·65	+6 8 9·11

Corrected for Aberration, and referred to the Mean Equinox of the respective dates.

"Taking into account the perturbations as usual, the residual differences are,—

Observed—Calculated	
In Longitude. ″	In Latitude. ″
−0·29	+0·03
−0·10	+0·04
−0·39	0·00

"The place calculated from these elements differs from the observation of Oct. 21, 1850, by,—

In Longitude. ″	In Latitude. ″
+17·76	−2·24

"I had not much faith in this observation, though taken with all the care I could command; but in default of a better I made the

most of it, and as it turns out made too much of it. The extraordinary circumstance is, that an error so comparatively trifling should have such an enormous effect on the results; for, so far I can see, those results agree with the places of 1848, May 15; 1849, Aug. 31·5; and 1850, Oct. 21; as closely as 7-figure logarithms would admit of. It may be worth while to examine this subject more narrowly, but I have not leisure at present. It is certainly the most remarkable circumstance that has occurred in the course of my calculations.

"I subjoin the effect of perturbation by the *Earth*, *Mars*, *Jupiter*, and *Saturn*, from 1848, May 0·0, to,—

	δL	$\delta \pi$	$\delta \Omega$	δi	$\delta \varphi$	$\delta \mu$
1850.	″	″	″	″	″	″
Dec. 16	−211·07	+145·40	−41·57	−1·984	−120·45	−0·0607
1851.						
Jan. 5	191·39	170·30	42·09	2·017	120·38	0·0773
— 25	165·86	200·26	42·90	2·057	120·16	0·0996
Feb. 14	134·03	235·74	44·06	2·099	119·78	0·1279
Mar. 6	95·69	277·04	45·60	2·139	119·25	0·1625
— 26	50·99	324·24	47·58	2·169	118·57	0·2032
Apr. 15	— 0·20	377·43	50·07	2·183	117·78	0·2499
May 5	+ 56·37	+436·73	−53·12	−2·171	−116·93	−0·3021

CAMBRIDGE. Northumberland Equatoreal. (Prof. Challis.)

	Greenwich M.T.	R.A.	Log. $\frac{p}{P}$	N.P.D.	Log. $\frac{q}{P}$	No. of Comps.	Star.
1850.	h m s	h m s		° ′ ″			
Oct. 21	12 32 5·6	8 58 42·09	−8·638	69 25 30·0	−9·8813	8	(*a*)
29	12 28 28·0	9 11 18·90	−8·633	69 56 12·9	−9·8742	1	(*b*)
Dec. 5	11 51 56·4	9 54 20·27	−8·623	71 9 53·6	−9·8433	7	(*c*)

Assumed *Apparent* Places of the Stars.

	R.A.	N.P.D.	Authority.
	h m s	° ′ ″	
(*a*)	8 55 11·44	69 20 51·8	H.C. {17857 / 17861}
(*b*)	9 16 19·83	69 34 21·1	B.A.C. 3206
(*c*)	9 55 32·46	71 3 22·8	H.C. {19628 / 19629}

LIVERPOOL. Equatoreal. (Mr. Hartnup.)

	Greenwich M.T.	R.A.	N.P.D.	Star of Comp.
1850.	h m s	h m s	° ′ ″	
Dec. 5	12 20 59·4	9 54 20·86	71 10 7·6	B.A.C. 3453
	12 50 56·2	21·94	8·5	— —
11	12 34 44·0	58 16·19	4 58·3	— 3506
	12 54 41·8	16·72	56·0	— —
13	12 25 56·8	9 59 20·02	71 1 53·1	— —

The observations are corrected for refraction and parallax: log. Δ for parallax has been taken from Mr. Graham's ephemeris.

The following are the Assumed *Mean* Places of the Stars of Comparison for 1850·0 :—

	R.A.	N.P.D.	Authority.
	h m s	° ′ ″	
B.A.C. 3453	9 59 8·85	72 30 29·50	Green. 12-year Catalogue.
— 3506	10 8 5·40	71 30 54·24	Edinburgh Observations.

Ephemeris. By Mr. Graham.*

G.M.T.	*True* R.A.	*True* Decl.	Log. Δ.
	h m s	° ′ ″	
Dec. 2·0	9 51 30·63	+18 49 56·5	0·2245
7·0	55 19·27	50 55·6	·2109
12·0	9 58 25·71	18 56 3·6	·1974
17·0	10 0 47·39	19 5 53·2	·1840
22·0	2 21·72	19 33·1	·1709
27·0	3 6·12	19 38 6·2	·1583
32·0	10 2 58·44	+20 1 6·1	0·1463

FAYE'S COMET.

CAMBRIDGE. Northumberland Equatoreal. (Professor Challis.)

1850.	Greenwich M.T.	R.A.	Log $\frac{p}{P}$	N.P.D.	Log $\frac{q}{P}$	No. of Comps.	Star.
	h m s	h m s		° ′ ″			
Nov. 28	8 40 30·1	21 29 20·38	+8·530	97 11 40·1	−9·9161	5	(*a*)
29	7 46 55·4	30 53·72	8·430	97 9 46·7	·9228	8	(*a*)
Dec. 6	6 22 32·7	42 30·93	8·243	96 51 46·6	·9281	4	(*b*)
7	8 0 46·8	21 44 22·33	+8·502	96 48 14·7	−9·9177	3	(*c*)

Assumed Apparent Places of the Stars.

	R.A.	N.P.D.	
	h m s	° ′ ″	
(*a*)	21 32 31·80	97 38 54·8	B. (Weisse) xxi. 781
(*b*)	39 45·89	96 36 17·9	— — 937
(*c*)	21 48 15·31	96 32 0·6	H. C. 42725

The R.A. of the star (*b*) in Weisse's catalogue is 1ᵐ in defect.

"The observations of the comet were obtained by my assistant Mr. James Breen, by means of the ephemeris published by Lieut. Stratford. On Nov. 28 and 29, the comet was excessively faint, although the sky was perfectly clear. On Dec. 6 and 7, it was seen with difficulty through a slight degree of mist. The mean value of the factor μ in the ephemeris is +0·272, as given by the observations of R.A., and +0·288, as given by the observations of N.P.D."

By a more careful comparison, M. Le Verrier finds $\mu = 0{\cdot}2903$, (see *Comptes Rendus*, Dec. 9, 1850, p. 792), and has furnished the following corrected ephemeris :—

* Lieutenant Stratford has printed and distributed a more detailed and convenient ephemeris of *Metis*.

Ephemeris of Faye's Comet, corrected by M. Le Verrier, from Prof. Challis's Observations, 1850. Communicated in a Letter to Mr. Hind.

0h Mean Time at Paris.

1851.	R.A. h m s	Decl. ° ′ ″	1851.	R.A. h m s	Decl. ° ′ ″
Jan. 3	22 36 4	−4 25 58	Jan. 27	23 29 33	−0 57 36
7	44 34	3 55 57	31	39 0	−0 17 7
11	22 53 16	3 23 52	Feb. 4	48 34	+0 24 40
15	23 2 7	2 49 54	8	23 58 16	+1 7 35
19	11 7	2 14 7	12	0 8 9	+1 51 28
23	23 20 16	−1 36 40	16	0 18 2	+2 36 10

Lieut. Stratford has issued *two* ephemerides of Faye's comet, one a sweeping ephemeris, by which Professor Challis detected the comet; and a second, for every day and for Greenwich mean midnight, with the corrected value of μ.

MICROMETRICAL MEASURES OF DOUBLE STARS.

Cape of Good Hope. Equatoreal. (Mr. Maclear.)

Date.	Name.	R.A. h m	N.P.D. ° ′	Angle of Position. ° ′	No. of Measures.	Distance. ″	No. of Measures.	
1849·939	α Centauri	14 29	150 12	245 14	10	6·99	20	Satisfact^{y}.
·939	...	...	...	245 16	10	6·94	20	Ditto.
1850·038	...	...	...	245 56	10	7·20	20	Middling.
·038	...	...	...	245 33	10	7·04	20	Good.
1850·104	...	...	...	246 38	10	7·01	10	Wings.
1849·928	*h* 3823	5 55	121 3	131 38	10	3·94	20	Difficult.
1850·016	Δ 70	8 24	134 14	349 18	10	4·65	10	Excellent.
1850·016	*h* 4128	8 37	149 47	218 23	10	2·13	20	Fair.
1850·030	*h* 4130	8 37	147 0	223 31	10	4·07	10	Faint.
1850·041	R 9	8 41	148 6	111 15	10	4·48	20	Working.
1850·096	*h* 4249	9 42	124 20	127 23	10	3·94	4	Indiff.
1850·096	ν Argûs	9 43	154 23	124 53	10	5·58	10	Indiff.
1850·104	ε Can. Maj.	6 53	118 46	161 12	10	7·48	10	Steady.
1850·107	...	...	...	159 58	10			The same.
1850·131	α Crucis	12 18	152 16	118 48	10	5·57	20	Good.

"The above, excepting ε *Canis Majoris*, are from Sir John Herschel's specific list recommended to be watched.

"The companion to ε *Canis Majoris* is a sharp point, the stars are related in magnitude, as Rigel and his companion. The measurement is very difficult.

"All the measures for distance were by repetition."

Mr. Maclear has also made numerous observations of the following stars for ascertaining their parallax, during the years 1842–1849:—

	Double Obs.	Single Obs.		Double Obs.	Single Obs.
β Hydri	3	56	β Crucis	130	31
α Phœn.		4	ι Centaur.	87	28
Achernar	71	5	β —	177	30
Canopus	97	5	β Trianguli	15	93
π Argûs	163	29	α —	8	144
δ Crucis	9	50	α Pavonis	7	4
α —	8	144	α Gruis	21	12
γ —		103			

Second list of Stars in the British Association Catalogue already observed, in which the Right Ascension differs by more than One Second in Time from that Catalogue. By Lord Wrottesley.

B. A. C.	Excess of Observed Mean Place above B. A. C.	No. of Obs.	B. A. C.	Excess of Observed Mean Place above B. A. C.	No. of Obs.
	s			s	
547	−10·84	5	6447	− 2·63	5
5312	− 1·23	2	6505	− 1·24	2
5673	− 6·75	2	6565	− 1·39	5
6059	− 1·15	2	6578	− 2·05	5
6108	− 2·40	3	6613	+ 1·48	2
6132	− 1·68	3	6982	− 1·38	2
6199	− 1·08	5	7006	+ 1·62	5
6213	+ 1·32	6	7063	− 2·31	5
6245	+ 1·32	5	7128	+ 3·96	5
6280	− 4·36	2	7133	+ 1·07	5
6338	− 2·78	3	7150	− 1·38	3
6374	+ 2·00	5	7310	−39·90	5
6396	− 1·29	2	7327	+ 2·20	2
6400	− 2·25	3	7347	−10·34	5
6408	− 2·98	4			

Note on 70 Ophiuchi. By Mr. J. Fletcher.

Recent measures of this star stand thus:—

Observer.	Position.	Distance.	Epoch.	Angr. Velocity.
	° ′	″		° ′
Smyth	126 30	6·25	1838·51	−1 15
—	122 24	6·64	1842·55	−1 1
Jacob	120 12	6·83	1846·25	−0 35
Fletcher	116 59	6·46	1850·65	−0 43

"It would seem that the companion of this highly interesting star has now passed its periastre, and is returning rapidly towards its primary.

"I believe the period will turn out very nearly 90 years."

Extract of an earlier letter from Mr. Maclear.

After mentioning his present course of observation, Mr. Maclear says,—

"Computers and copiers perform the drag-work at comparatively little expense. My experience in this climate shows, that one observer can furnish plenty of common arithmetic for two active computers. There is much of somewhat extraneous work, too, falls in my way—in person—exclusive of the functions officially known at home.

"I am well supported by Mr. Mann: his clear, methodical head has waded through eight years of tide-gauge diagrams. He is now taking a leading share in putting to rights the positions of the smaller objects of the British Association Catalogue. An account of about forty was sent to you, and about an equal number are nearly ready to follow. I cannot exactly say what the probable number of corrections will amount to, but I should think not less than 150. For my absolute right ascension of these, I cannot spare more than two or three observations with the 10-feet transit; because all stars entered in the catalogue as having 'proper motion' worth consideration, must pass that instrument. It is an invidious piece of work, but it is a matter of duty. Sir Thomas Brisbane, I am sure, will feel glad for this scrutiny of the work performed by him and at his cost; and Mr. Rümker will doubtless view the subject in the same light. Lacaille's errors are traceable mostly to *errors of entry:* for by transposing ingress for egress in the *Cœlum Australe*, and bringing up, a star is found which he is supposed to have overlooked. Such errors would happen to any observer, where several objects were in the field. His estimate of the magnitudes of the smaller stars is very rough."

Notice of Communications received lately from Mr. Maclear.

Several memoirs from Mr. Maclear have been received by the Admiralty and forwarded to the Society. As these will probably be printed in full elsewhere, it will be sufficient here to describe the contents very briefly.

The most important is "A Report from the Cape of Good Hope Observatory," giving a full explanatory account of Mr. Maclear's scientific labours up to July 1850. It is arranged under the following heads:

1. Personal establishment.
2. Instruments.
3. Astronomical work performed.
4. Measure of the arc of meridian.
5. Reductions and printing,—some general remarks follow under a sixth head.

A second memoir contains "Particulars relating to the mounting of the equatoreal Instruments at the Cape, one in 1847 and another

in 1849." The telescope of the first, 45 inches focus, was mounted on a portable equatoreal stand, and originally belonged to the Cape Observatory. The Astronomer Royal supplied Mr. Maclear with an old polar axis (we believe by Sisson) which was not wanted at Greenwich, and this was prepared for the 45-inch telescope by Mr. Simms. Mr. Maclear received this polar axis in 1846, and, on his return from the survey in the autumn of 1847, mounted it in a suitable building. Up to this time the observatory had no equatoreal except this 45-inch telescope and stand.

In 1849 Mr. Maclear received another equatoreal more worthy of his observatory and its director. This beautiful instrument resembles very nearly that of Mr. Dawes, and indeed most of those which have proceeded from the same artist, Merz of Munich. The object-glass is 6·9 inches aperture, and 8½-feet focal length, and supports the reputation of the school of Fraunhofer.

"A new and more accurate Reduction of the Observation of the Comet of 1843" follows. A former reduction had proved faulty from the inaccurate identification of some of the stars of comparison, *when there was no equatoreal.*

"The Opposition of *Mars* in 1849-50," for the purpose of determining the parallax of the planet and of the sun, forms the fourth memoir. These have been very partially printed in the *Monthly Notices*, vol. x. p. 156, *i. e.* so far as for determining the places of *Mars*, his parallax being *assumed* to be known.

Lastly, we have two portions of a series of "Comparisons with the Heavens of the Southern Stars in the British Association Catalogue." This work was first attempted with *both* instruments, but for reasons which are obvious, Mr. Maclear has now resolved to confine himself to the mural circle alone. The transits by this instrument are *nearly* good enough for the purpose, and can always be made so by a few independent right ascensions of well-selected stars determined subsequently by the transit.

Extract of a Letter from Lieut. Gilliss, U.S.N., to Capt. Smyth, Santiago de Chile, July 28, 1850.

"Can you send me the numbers of the *Monthly Notices* through Mr. Abbot Lawrence, who I am sure will cheerfully forward them through the U. S. State department?

"Our catalogue of southern stars was not commenced until February last, between which time and the 1st of May the observations were almost uninterrupted by cloudy nights. May, June, and July, have afforded me only thirty working nights; an amount of obscure weather heretofore unknown at Santiago during the same periods: but as the winter is regarded as over, it may reasonably be expected we shall not have more than twenty unfavourable nights in the ensuing eight months.

"The field embraced by the five horizontal wires of the circle is 17′, and as they are moveable by a micrometer screw, the belt

or zone swept each night is 24′ wide by 4^h long; more than an hour before and after each zone being given to examination of *all* the instrumental adjustments, necessary in a land where we have sometimes (as this present) monthly no less than five earthquakes; moreover, such course makes each zone independent.

"So far, we have been most struck by the discordancies between our estimated magnitudes and those of Lacaille; discordancies reconcilable only on the supposition of a multitude of variable stars altogether disproportioned to the known number of those in the northern hemisphere of the heavens. Were these differences between us uniform, it would not surprise me, but there are stars in the *same* belt varying much from the brightness he assigned them; others, *not* observed by him, larger than many in the zone that he did; and others, again, which, if existing, are certainly not so large as the 12th magnitude. Below you have a list of corrections necessary to these catalogues of the British Association and Lacaille.

B.A.C. No. 2738 is No. 3200 Lacaille.
— — 3342. Unsuccessfully sought three times. Cannot be 12th mag.
— — 3482. Unsuccessfully sought four times. Cannot be 12th mag. *Observed by two others!*
— — 3586. Does not exist. Is probably 3599 which we find.
— — 4058. Lacaille's declination *correct*.
— — 4661. Unsuccessfully sought twice.
— — 4871. Does not exist, if so bright as 12th mag.
Lacaille No. 3489. Brisbane's declin. right. Lacaille in error −7′.
— — 3682. Declination in error +5′.
— — 4811. Declination wrong. Brisbane right.
— — 5105. Does not exist, if of 9th mag.
— — 5473. } One of these does not exist. I cannot tell which, without
— — 5477. } knowing whether the reduction is correct.
— — 6019. Does not exist, unless its R.A. is here 7^m too great.
— — 6028. The computer was *wrong* in subtracting 10^m from the R.A.

"We have reason to think that the companion to *α Scorpii*, which our circle telescope shows very well under ordinary illumination, is also variable, as well as many of the minute stars about *η Argûs*; else I can scarcely conceive that our 52 lines' object-glass would so readily show the two *very minute* ones spoken of by Sir John Herschel in § (81), page 37, of his observations at the Cape, when his 20-feet failed to rescue them from obliteration in the light of the large star. *η Argûs* was undoubtedly brighter than the two stars of *α Centauri* at the date of our measures in March, but is on the wane, and is now very little superior to them. There has evidently been a rapid change in the position of α^1 and α^2 *Centauri*, if the places given in the British Association Catalogue are nearly correct. We have 18 (116 wires) differences of right ascension, and 15 differences of declination measured with the micrometer screw at transit over the meridian; from which it results, that α^1 precedes α^2 by $0^s{\cdot}922$, and is south of it $3''{\cdot}66$. The mean epoch is June 1. An entire revolution of the micrometer-head, which is above an inch in diameter, is $27''{\cdot}9$, and the power

under which the measures have been made is 98, which is used for all observations.

"The latitude of Santiago will not vary greatly from 33° 26′ 22″ S., nor its longitude from $4^h\,44^m\,19^s$ W.; very different, you will perceive, from the geographical position heretofore assigned. The longitude is the result from three occultations and five culminations of the moon, on the assumption that the tabulated places of the moon and stars are correct."

Note from Mr. Warren De la Rue.

"I have been in the habit, for some time past, of making drawings of the double stars on small black discs, which are cut out from paper which has been previously gummed at the back, and found them so convenient that I sent several to my friends Mr. Lassell and Mr. James Nasmyth. Those gentlemen were pleased with them; and the latter begged me to bring them before the notice of your Society, thinking that observers would be glad of the suggestion. In illustration of their use, I have sent my copy of Smyth's 'Bedford Catalogue,' which contains drawings of several double and multiple stars, as seen with my 13-inch equatoreal reflector of 10-feet focal length."*

On the Longitude of the Observatory of Stonyhurst College.
By the Rev. A. Weld.

In determining the difference of longitude between the observatories of Liverpool and Stonyhurst, Mr. Weld received, as might be expected, every assistance from Mr. Hartnup.

The chronometers employed were Nos. 222, 258, and 263, all made by Mr. Shepherd, of Liverpool, with the balance invented by Mr. Hartnup.

They were rated by the Liverpool transit clock (using coincident beats for the comparison) on Oct. 23, 24, and 25. On the 25th, Mr. Weld transported them to Stonyhurst, where they were compared with the sidereal clock at 9 P.M.; and at midnight, several transits being observed in the interval.

On the morning of the 26th, Mr. Weld again compared the chronometers with the Stonyhurst transit clock; set off for Liverpool at $7^h\,40^m$ A.M.; compared with the Liverpool clock on his arrival, at $10^h\,30^m$; observed several transits, compared a second time; then started at $4^h\,30^m$ P.M. for Stonyhurst, where the chronometers were compared with the transit clock on the same evening, and some transits observed.

* The stars and nebulæ are very neatly represented by white on the black ground, and the illustrations, when finished, are readily appended to the text, in print or manuscript.

The next day was Sunday. On Monday morning, some stars were observed; the chronometers were then compared with the Stonyhurst transit clock. Mr. Weld started for Liverpool, where, on his arrival, the chronometers were compared with the transit clock.

Mr. Weld considers these observations to form two complete trips from Liverpool to Stonyhurst and back. In the first trip the travelling and stationary rates were considered to be identical; in reducing the second trip the travelling rate was adopted, on Mr. Hartnup's suggestion.

The results are as follows:—

Stonyhurst, East of Liverpool.

	First Trip.	Second Trip.	Mean.
	m s	m s	m s
Chronometer 222	2 7·27	2 7·45	2 7·36
— 258	2 7·28	2 7·46	2 7·37
— 263	2 7·40	2 7·34	2 7·37

	m	s	
And as Liverpool is	12	0·05	West of Greenwich,
And Stonyhurst	2	7·37	East of Liverpool.
Stonyhurst is	9	52·68	West of Greenwich.

All the observations, comparisons, and computations, are detailed.

On the Nomenclature applied, in some instances, to Stars in the British Association Catalogue. By Mr. Woolgar.

"By the published list of Lunar Occultations for 1851, it appeared that there will be three visible occultations of a star of the 4th magnitude, designated as B.A.C. 845. The first impression is that of surprise that so large a star should not have found a place in the other catalogues: in truth, it is a star familiar to astronomers as *μ Ceti*, Fl. 87. To those only in possession of the Association Catalogue, comprising probably not one-third of the persons who take an interest in such phenomena, will the cause of the expression be intelligible.

"I hope I shall not be accused of depreciating the labours of the late Mr. Baily, when I state that the exclusion from the catalogue of so familiar a designation as that of 87 *μ Ceti* is the consequence of a rule adopted *only just before the catalogue in question was sent to the press:* it is, that in the case of stars common to Ptolemy and Bayer the allotment of constellation is to be conformable to the former, where they disagree.*

"Considering what a firm hold the letters of Bayer have obtained, and that Mr. Baily himself deemed it most advisable to

* See Introduction to the B.A.C. pp. 59, 60.

recur strictly to those letters in the instances where they had been deviated from by Flamsteed or others, it is to be regretted that an exception should have been introduced in the case of this star and of Fl. 85.

"Our respected President, in his 12-year catalogue, has retained the old and familiar appellation, inclosing it, however, between brackets.

"An inspection of the map shows that the star can most easily be included within the contour of *Cetus*."

**On a new Variable Star.* By Mr. Hind.

On the 4th of November a fiery-looking star, of the seventh magnitude, was discovered by Mr. Hind at Mr. Bishop's observatory, Regent's Park, in a position where there is no record of one having been observed previously. It is situate near the star numbered 400 in Hora I. of Weisse's Catalogue, and called a ninth magnitude by Bessel, and is preceded by another, also of the ninth magnitude, at an interval of $9^{s}\cdot1$ and $5'\,21''$ further north. The mean place of this variable star for the commencement of 1850 is,

R.A. $1^{h}\,22^{m}\,54^{s}\cdot48$ N.P.D. $87^{\circ}\,53'\,39''\cdot5$.

This star is not noticed by Lalande or Bessel, and does not occur on the excellent map recently published by the Berlin Academy, which was formed by Professor Olüfsen, of Copenhagen. There appears no doubt of its proving an interesting variable star. It is worthy of remark that the ruby or fiery colour is precisely similar to that which characterises several other stars, known to be of changeable brilliancy, which have been detected at Mr. Bishop's observatory during the last five years.

Mean Places of this Star. By M. C. Rümker.

1850.	h m s	o ′ ″
Nov. 16	1 22 54·02	+2 6 22·0
26	54·19	23·1

**Change of Colour in a Fixed Star.* By Mr. J. R. Hind.

"With the single exception of a somewhat doubtful alteration in the appearance of *Sirius*, I am not aware that there exists any mention of a decided *change* of colour in a fixed star. I am able to supply one from my own observations during the last two years of stars lying near the ecliptic. On September 3, 1848, one of a '*very red*' colour was entered on a chart in right ascension, $5^{h}\,34^{m}\cdot8$; north polar distance, $68^{\circ}\,54'$ for 1800; there are other

* The papers with an asterisk prefixed were in type at the time of publishing the preceding Number, but were postponed, as the publication would have been inconvenient for binding. A memoir by Mr. John Riddle is not inserted in the present Number, as it would then overrun two sheets, and incur a 4*d.* postage.

stars of a ruddy tinge in the neighbourhood. As I have repeatedly met with reddish variable stars, this object has been closely watched since the above date, but no alteration was perceived till the evening of November 14, in the present year, when I found the star decidedly *bluish*, the red tinge having vanished entirely. Perhaps it would now be most accurately described as *bluish white*. I am not able to furnish the exact position of this star, but the rough place above given will be quite near enough to ensure the observation of the right object."

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*Mr. Boreham remarks, "The star Argelander Zone 5, No. 26, does not exist."

"There is a star with a declination (1850·0) + 54° 40′ 21″·8, which agrees with it in R.A. It is probably the same as B.A.C. 4845 = Groombridge 2138."

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*Mr. John Drew, F.R.A.S., of Southampton, has sent an extract from his observing-book, which shows very clearly that his sidereal time may be relied on to a small portion of a second. Mr. Drew has replaced his original transit by a transit-circle, which, however, as yet has only been employed in observing right ascensions.

Mr. Stebbing, who has charge of the chronometers of the steamboats from Southampton, has taken Mr. Drew's transit, and proposes to find the rates and errors of his chronometers by astronomical observations.†

On the Influence exerted by Heat upon the Dispersive and Refractive Power of Liquids. Preliminary Observations. By Rev. T. Pelham Dale.

This paper contains a numerical statement of the values found by the use of Professor Powell's apparatus (formerly employed for the determination of values communicated by Professor Powell to the British Association, and now lent by him to Mr. Dale), for the indices of refraction of Fraunhofer's lines, B, C, D, E, F, G, H, in distilled water, alcohol, Fusel oil, pyroxalic spirit, and bisulphuret of carbon, at temperatures ranging (for the most part) from 10° to 35° centigrade.

It does not appear that similar measures have been made before these.

The author describes in detail the method of using the apparatus. He remarks, however, that though the change of refractive index in general is obtained with great accuracy, the charge of irrationality can hardly be deduced from these measures.

† It is to be hoped that this example will be followed. Accidents at sea, owing to bad chronometers or imperfect compasses, *ought* to be reckoned with things that *have* been. There *need* not be any casualties arising from such causes.

Mr. Cullimore remarks that, on comparing the distances of the moon and of the external satellites of *Jupiter* and *Saturn* with the distance of each planet respectively from the sun, the ratio is nearly the same, *i.e.* about 1 : 400. This remarkable analogy leads him to suspect that the law may be more general, and that it would be worth while to look for an exterior satellite of *Uranus* and of *Neptune* at the same relative distance.

**Letter from the Rev. W. Read, Vicarage, South Mimms.*

"On Wednesday the 4th of September, about half-past nine A.M., while engaged in adjusting my equatoreal for observing the planet *Mercury*, I was much surprised to find great numbers of self-luminous bodies traverse the field of view of the telescope.

"They passed with different velocities, some slowly, and others with great rapidity; possessing apparently about the brightness of *Venus*, with which I compared them; and with discs all perfectly round and well defined.

"They appeared to occupy a zone several degrees in breadth, the centre of which was about 44° altitude. Their size was extremely varied, from about 2″ or even less, to about 20″, and a few much larger, which seemed to move with less velocity than the others, and had, perhaps, not quite so great brilliancy.

"The direction they took, principally, was from due east to west; but many passed at angles a little differing therefrom, while some took a direction from north to south; but I believe none in the contrary order.

"I continued to observe them at intervals, for about six hours, during which period there was scarcely any cessation; sometimes crowding through the field of view so numerously as not to permit them to be counted.

"The number which passed must have been inconceivably great; as, though the telescope was moved through a zone of several degrees in breadth, they appeared equally numerous; but if there were any perceptible difference, they seemed to be rather more frequent in the immediate vicinity of the equator.

"There were very few shooting stars at night; and I only noticed one, during a long and attentive observation on the day following.

"They readily bore a magnifying power; and where a high one was applied, no spots or variable brightness in the discs of even the largest were discernible.

"They appeared self-luminous; as when viewed even near the sun, they still retained their perfect round form, without gibbosity or crescent shape.

"I may mention that the telescope employed is one of Dollond's, $2\frac{3}{4}$ inches aperture, $3\frac{1}{2}$ feet focal length, and admirable in its performance. I counted many hundreds, though the field of view was so small." †

† May not these appearances be attributed to an abnormal state of the optic nerves of the observer? *Editor.*

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